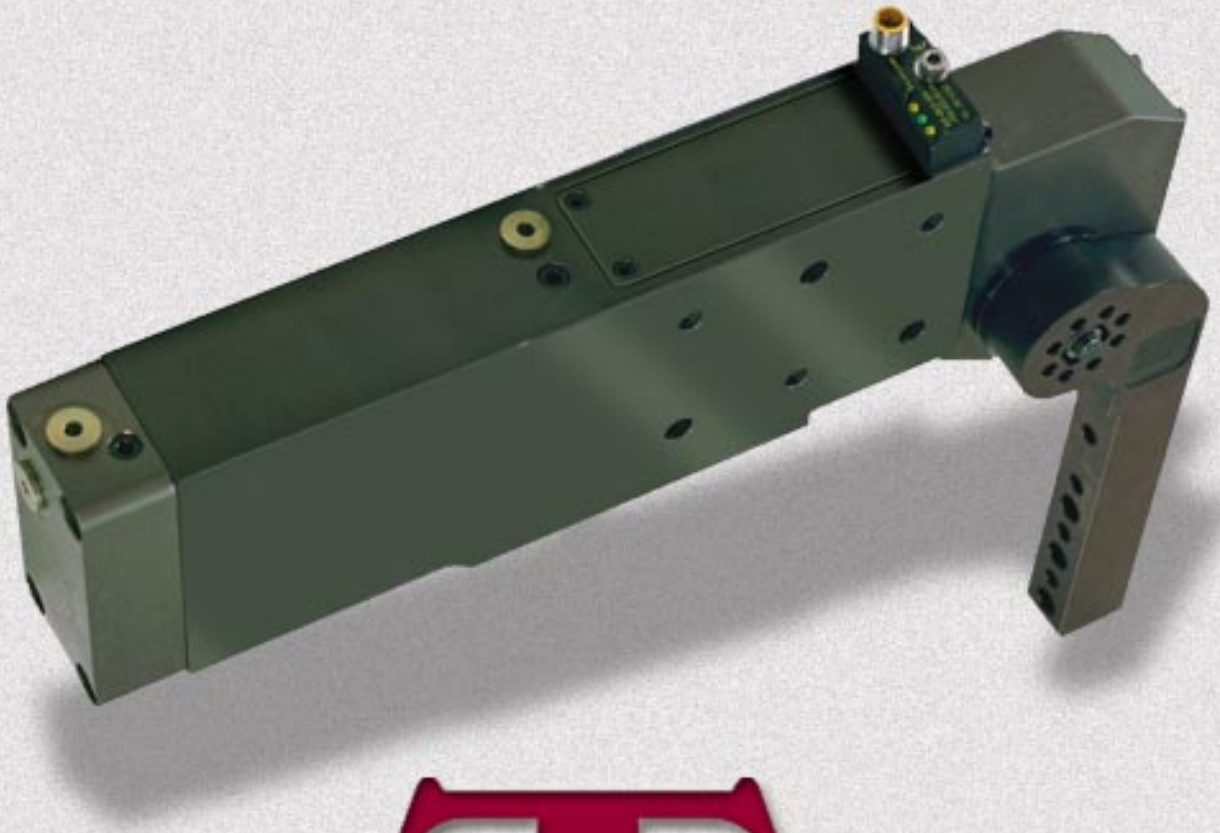
STC Series TRI-LOK Power Clamps
User's Guide



BTM®

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Standard Products & Automation Division

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User's Guide - BTM STC Model Tri-Lok Clamps

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User's Guide - BTM STC Model Tri-Lok Clamps

Warning!

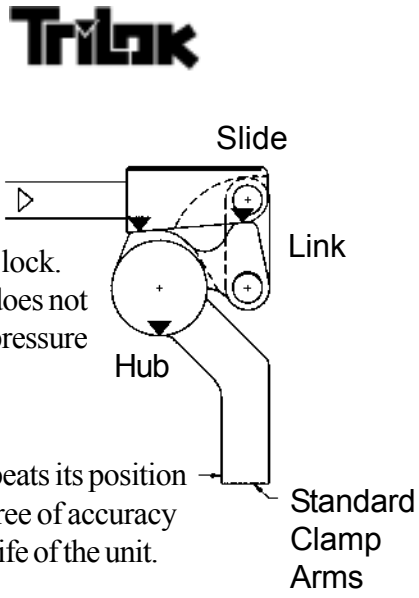
Always disconnect air and electrical supply lines before working on or around power clamps.

Introduction:

Thank you for selecting BTM's patented STC model power clamp.
Our goal is to provide our customers with the best value in power clamps available. This User's Guide is intended to help you get the most value from the product; please read it through carefully. If you have questions, call BTM at 810-364-4567. For service issues call our service pager at 810-340-3500 to leave a message and we will promptly return your call.

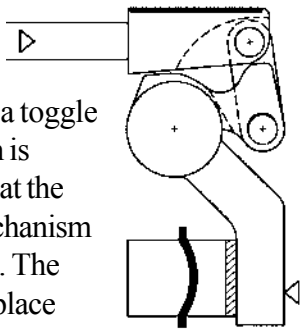
1. The TRI-LOK Mechanism:

BTM's patented TRI-LOK Mechanism can be used as a clamp or a precision back up, and eliminates "over-center" clamps.

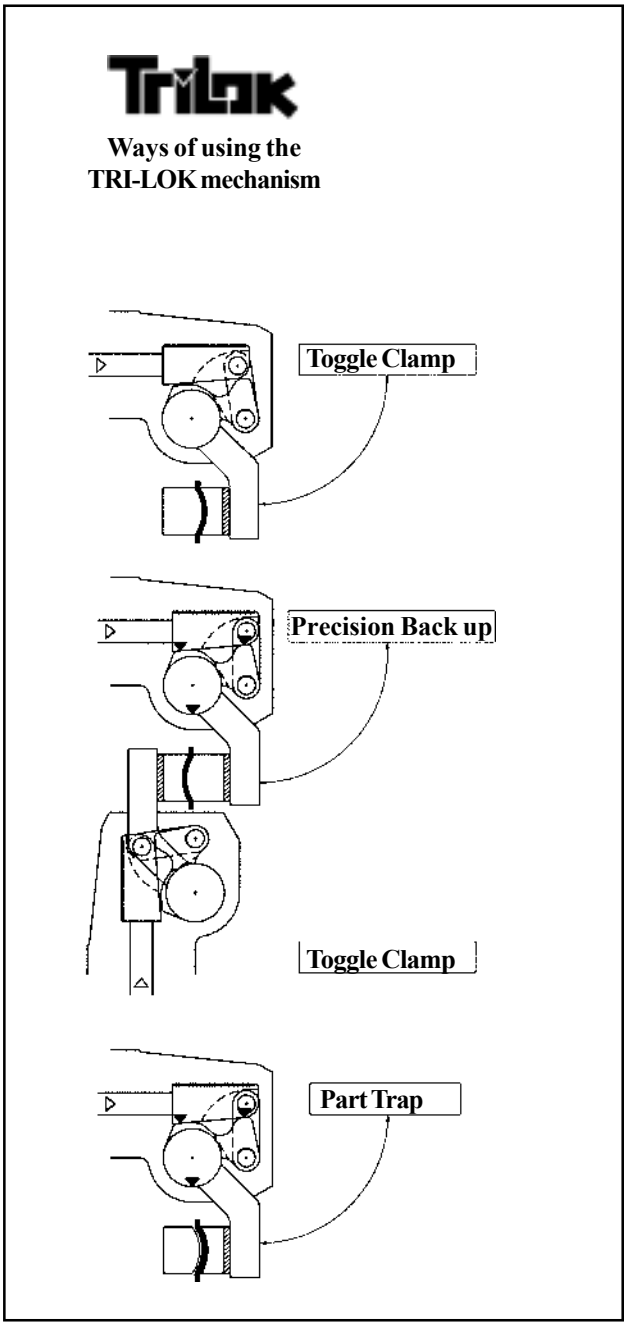


A three point lock. Mechanism does not unlock if air pressure is lost.

This surface repeats its position with a high degree of accuracy throughout the life of the unit.



When used as a toggle clamp, the arm is shimmed so that the TRI-LOK mechanism is not engaged. The locking takes place within the linkage.



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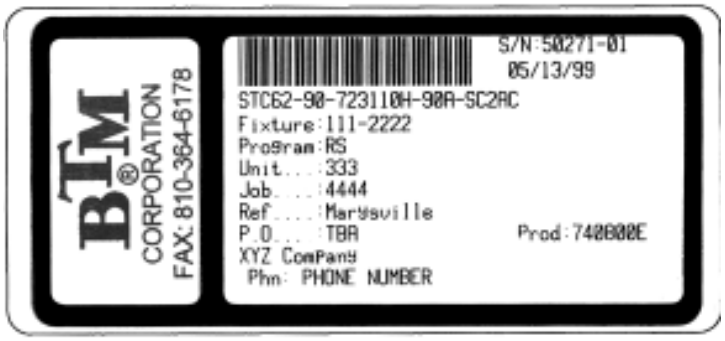
2. How to read the label

The label affixed to a BTM clamp contains the following information: (*Ref. catalog 01-C*.)

Serial Number : Used for tracing information.
Date : Date clamp was shipped from BTM.
Model Number : Indicates Clamp size & mounting style, degree of arm rotation, arm number, arm position and switch number.
Optional customer specific information: Customers may supply additional information for logistics purposes, such as; fixture identification, program, unit, job, reference & purchase order numbers.
Contact information : Distributor name and telephone number.
Product Number : Identifies specifics of clamp: port size and type, mounting and degree of rotation.



Typical BTM clamp label

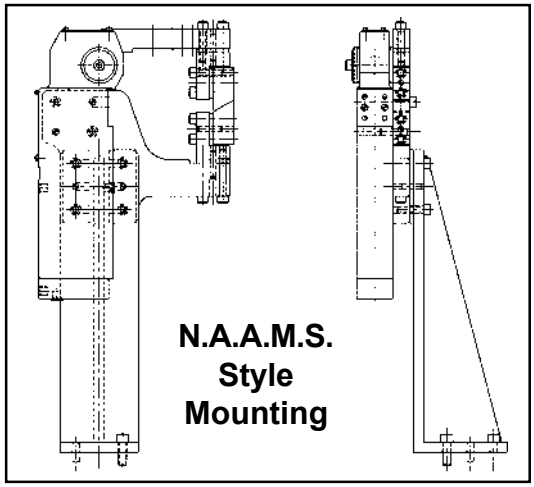
3. How to mount the clamp:

Notice:
Blind dowel holes - (1) on each side. Do not drive through! Remove with dowel puller.
Blind threaded holes (2) each side.

Oval style STC (52, 62 & 82) clamps have (1) blind dowel hole on each side. Assembly personnel should use care when inserting or removing dowel pins not to drive them through. Screw holes are also provided and require the following torque settings to be applied when mounting:

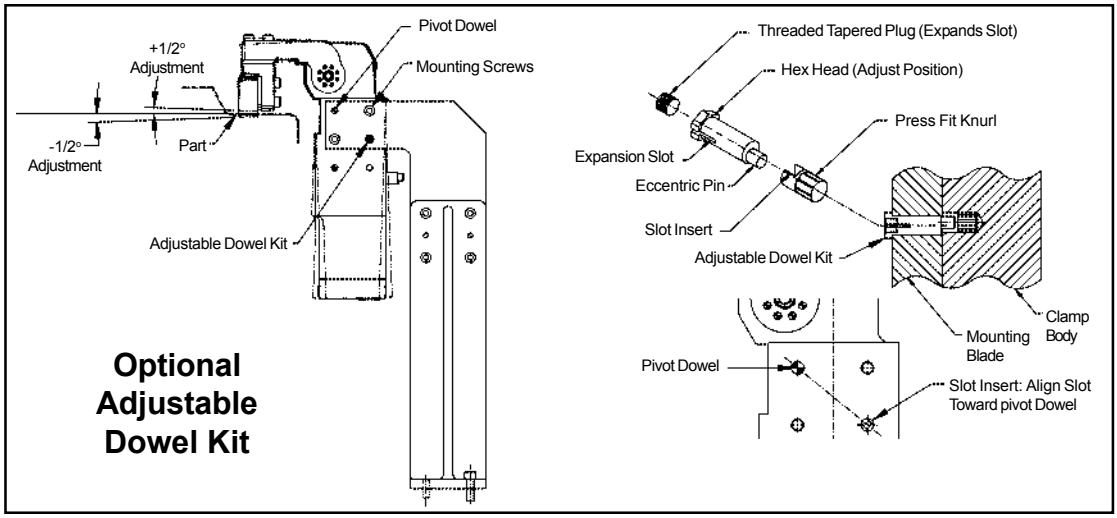
STC52= [M8 Screw] 39 Nm (29 ft-lbs)
STC62= [M10 Screw] 77 Nm (57 ft-lbs)
STC82= [M12 Screw] 135 Nm (100 ft-lbs)

Weldments or other mounting provided for the clamp must be of sufficient rigidity to allow consistent delivery of the force required by the application.



3.1 Optional Adjustable Dowel Mounting Kit:

BTM's adjustable dowel kit allows precise adjustment of the clamp arms closed position after mounting, by means of a lockable eccentric dowel which rotates the clamp (± 1/2°) relative to a second "pivot" dowel. The slot insert is press- fit in the clamp body with the slot oriented toward the pivot dowel. Adjusting the eccentric pin rotates the clamp relative to the mount.



4. Welding on Clamp Arms:

Remove the clamp arm before welding on it, or attach the ground cable directly to the arm so as not to pass current through the bearings of the clamp mechanism.

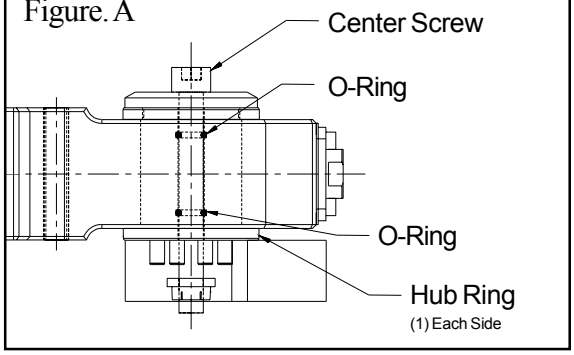
5. Removal and Remounting of the Clamp Arm

Warning! Disconnect air pressure before attempting to remove the clamp arm.

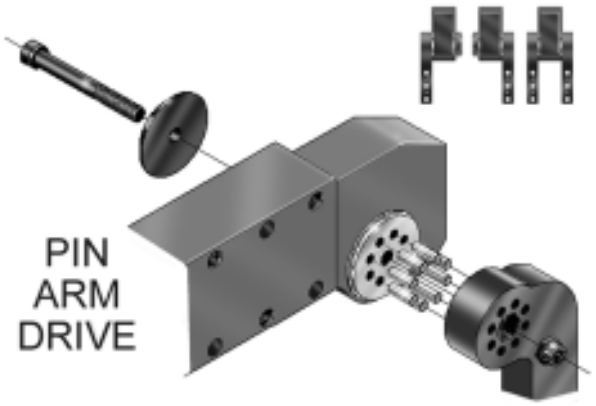
BTM's patented pin arm drive simplifies arm changes. To remove the clamp arm(s) remove the nut on the center screw and carefully "unthread" the screw past the (2) internal "O" ring seals in the hub screw hole (Figure A.). ***Do not push the screw through, as damage to the "O" rings may result.*** Once the center screw is removed, the arm(s) may be tapped off with a mallet along with the assistance of a screwdriver lifting the arm away from the clamp body to balance the force from the mallet. Should the pins(s) become lodged in the arm, a through hole is provided to tap the pin from the arm with a drive punch and hammer. Remounting the arm is done by first making sure the hub ring thread is tight, then simply use the witness mark to properly locate the arm to the hub and tap the arm over the pins. Next, "thread" the center screw through the "O" rings - ***Again, do not push the screw through, as damage to the "O" rings may result.*** Finally, refit the nut and tighten the screw to the proper torque setting.

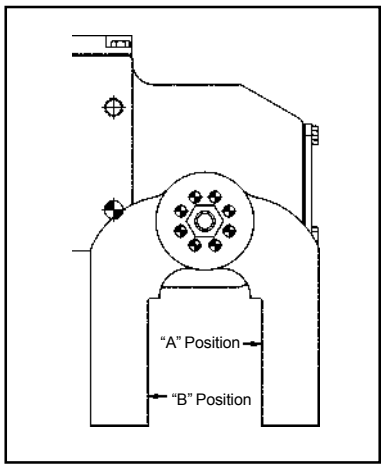
STC52= [M8 Screw] 23 Nm (17 ft-lbs)
STC62= [M10 Screw] 45 Nm (33 ft-lbs)
STC82= [M12 Screw] 79 Nm (58 ft-lbs)

Figure. A



6. Arm Mounting Features:
The BTM STC clamp features a pin drive hub, providing quick and easy positioning of the arm on either side of the clamp. Simply tap the pins through to the desired side or install longer pins for dual arms. The (8) pins allow for easy positioning of the arm at 45^0 increments. The machined surface of the arm may be turned to face either way ("A" or "B" position).





7. Air Supply
BTM STC model power clamps are designed to operate on 5.8 bars (85psi) or less of clean, dry air. Air delivery should be adequate to supply the following volume to each port to operate the clamp at a rate of 1 second open and 1 second closed:

STC 52 = 2.2 SCFM STC62 = 4.5 SCFM STC82 = 9.2 SCFM

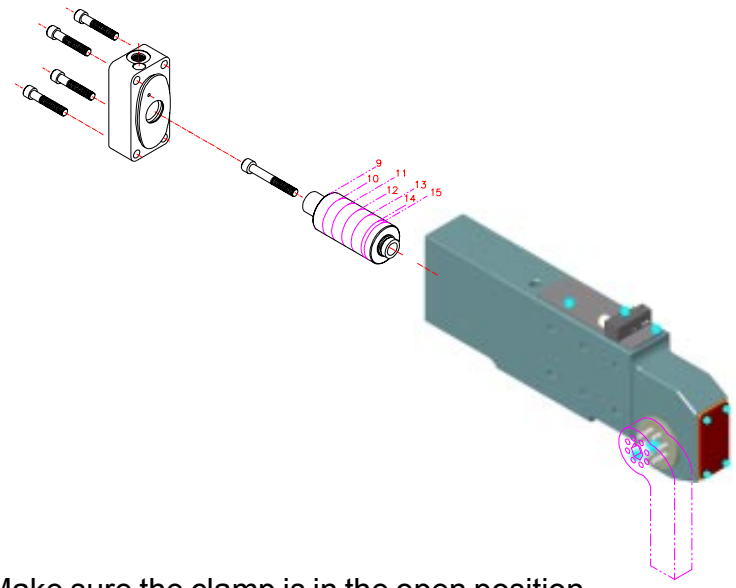
8. Cushion adjustment:
BTM STC model clamps are equipped with adjustable cushions to decelerate the arm mass and extend the life of the clamp. Properly adjusted cushions only slightly reduce the speed of the clamp. Start by closing the adjustment screw, then while cycling the clamp, gradually open the adjustment screw, until the speed is minimally affected. Adjust to achieve the required cycle rate not exceeding the maximum rate of 1 second open and 1 second closed. Cycling the clamp faster than the maximum rate may result in premature failure. *Refer to charts on page 6.*

8.1 Fixed Orifices:
STC model power clamps employ fixed orifices which are machined into the ports in both the end cap and in the clamp body. These orifices are intended to protect the clamp from operating in excess of the recommended cycle rate relative to the mass of the arm . In some instances a second, smaller, orifice and/or flow control valves may also be required. *Three possible conditions exist in the application of STC clamps:*

1. *Normal:* Speed and mass are compliant with the specification. No additional speed control device is required, but flow control valves should be added to reduce impact.
2. *Mass exceeds the charted specification:* A smaller secondary orifice must be installed at the manifold. Consult BTM's sales department for proper sizing of the secondary orifice. Flow control valves should also be added, in addition to the secondary orifice.
3. *Mass complies with specification, but additional speed reduction is required for machine timing or other purposes*: Flow control valves must be added to further reduce the cycle rate.

9. Changing the degree of rotation / rear cushion:

Before working on any clamp always disconnect the air pressure.
BTM STC model clamps are fitted with a removable rear cushion. This feature allows field changes of the degree of clamp opening. Refer to the drawing on *page 7*. Proximity switch positions must be changed accordingly (see 9.1 below).



STC 52

9	REAR CUSHION ~ 30°	727007A
10	REAR CUSHION ~ 45°	727001B
11	REAR CUSHION ~ 60°	727001C
12	REAR CUSHION ~ 75°	727001D
13	REAR CUSHION ~ 90°	727001E
14	REAR CUSHION ~ 105°	727001F
15	REAR CUSHION ~ 120°	727001G

STC 62

9	REAR CUSHION ~ 30°	726007A
10	REAR CUSHION ~ 45°	726001B
11	REAR CUSHION ~ 60°	726001C
12	REAR CUSHION ~ 75°	726001D
13	REAR CUSHION ~ 90°	726001E
14	REAR CUSHION ~ 100°	726001F
15	REAR CUSHION ~ 120°	726001G

STC 82

9	REAR CUSHION ~ 30°	726510A
10	REAR CUSHION ~ 45°	726501B
11	REAR CUSHION ~ 60°	726501C
12	REAR CUSHION ~ 75°	726501D
13	REAR CUSHION ~ 90°	726501E
14	REAR CUSHION ~ 105°	726501F
15	REAR CUSHION ~ 120°	726501G

1. Make sure the clamp is in the open position.
2. Unscrew (4) S.H.C.S. to remove the End Cap.
3. Remove the S.H.C.S. holding the rear cushion and piston to the piston rod.
4. Pull out the rear cushion (Details 9 - 15)
5. Replace Rear Cushion with the appropriate detail to achieve required degree of opening. Use Blue Loc-Tite on Cushion/Piston screws and apply a thin coat of grease to underside of screw head. Tighten screw to appropriate torque (see below).
****NOTE: A cushion alignment tool must be used to prevent the piston from rotating when the screw is tightened****
6. Reassemble End Cap and torque screws to appropriate torque (see below).

9.1 If the clamp is equipped with a status controlloer switch block:
7. Remove screws securing the switch block and remove the block.
8. Reposition the rear proximity sensor to the appropriate location and reassemble. Make sure the wires are properly packed and the o-ring seal beneath the seal plate is in its groove as the block is fitted. Then tighten the block to the body.
****NOTE: S2 Is always in the closed position.****

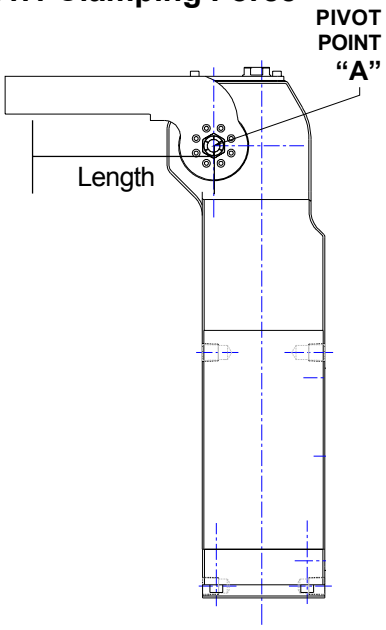
CLAMP	CUSHION ALIGNMENT TOOL	PISTON SCREW TORQUE	END CAP SCREW TORQUE
STC 52	727007AT	12 lb-ft (16 N-m)	12 lb-ft (16 N-m)
STC 62	726007AT	24 lb-ft (32 N-m)	24 lb-ft (39 N-m)
STC 82	726510AT	75 lb-ft (102 N-m)	50 lb-ft (68 N-m)

10. Lubrication

BTM STC model power clamps are lubricated for life at the factory. No other lubrication is necessary. In line air lubrication is not required.

11. Proper Application Specifications

11.1 Clamping Force



Force Output Formulas

STC52

$$\text{NEWTONS} = \frac{16{,}500 \times \text{LINE PRESSURE (BARS)}}{\text{LENGTH (mm) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

$$\text{POUNDS} = \frac{10 \times \text{LINE PRESSURE (PSI)}}{\text{LENGTH (in) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

STC62

$$\text{NEWTONS} = \frac{46{,}500 \times \text{LINE PRESSURE (BARS)}}{\text{LENGTH (mm) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

$$\text{POUNDS} = \frac{28.5 \times \text{LINE PRESSURE (PSI)}}{\text{LENGTH (in) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

STC82

$$\text{NEWTONS} = \frac{92{,}000 \times \text{LINE PRESSURE (BARS)}}{\text{LENGTH (mm) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

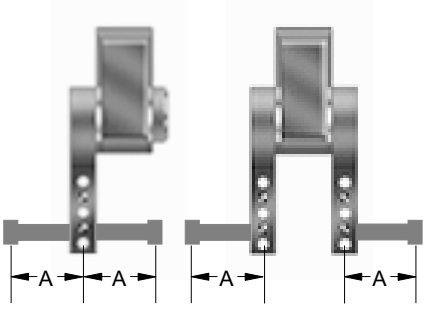
$$\text{POUNDS} = \frac{55 \times \text{LINE PRESSURE (PSI)}}{\text{LENGTH (in) FROM POINT "A" TO CENTER LINE OF CLAMPING CONTACT AREA ON CLAMP ARM}}$$

11.2. Permissible Clamp Offset Distance

STC52 ~ SINGLE ARM: A = 37.5mm
DUAL ARM: A = 75mm

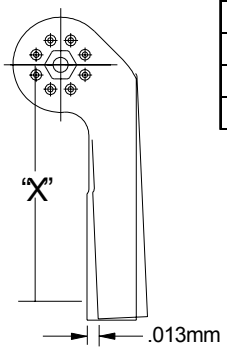
STC62 ~ SINGLE ARM: A = 75mm
DUAL ARM: A = 150mm

STC82 ~ SINGLE ARM: A = 150mm
DUAL ARM: A = 300mm



11.3. Arm Deflection Under Load

Force on arm at "X" distance from pivot resulting in 0.13mm [.005"] Maximum deflection.



STC52	
"X" (mm)	Force (N)
125	113
100	165
75	290

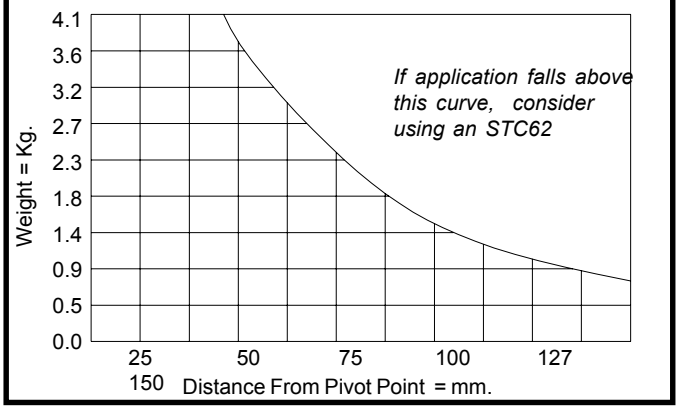
STC62	
"X" (mm)	Force (N)
250	156
225	200
200	245
175	289
150	378
125	489
100	734

STC82	
"X" (mm)	Force (N)
370	165
340	205
310	267
280	365
250	449
220	623
190	1005
160	1397
130	2073
100	3065

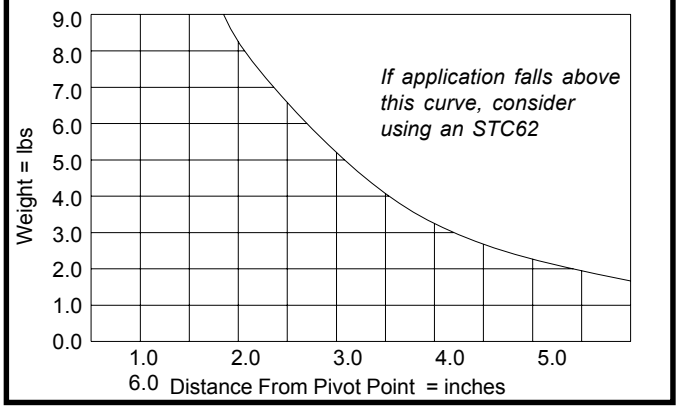
11.4. Maximum Allowable Weight on Clamp Arm Assembly

Refer to the charts below for model specific information regarding the recommended allowable weight on the arm at given distances from the pivot. The distance from Pivot Point is the straight line distance from the centerline of the clamp at the pivot point to the center of gravity of the clamp arm assembly. The center of gravity is figured using the weight of the arm plus the total weight mounted on the arm. When using dual arms, add the weight of the second arm to the total weight.

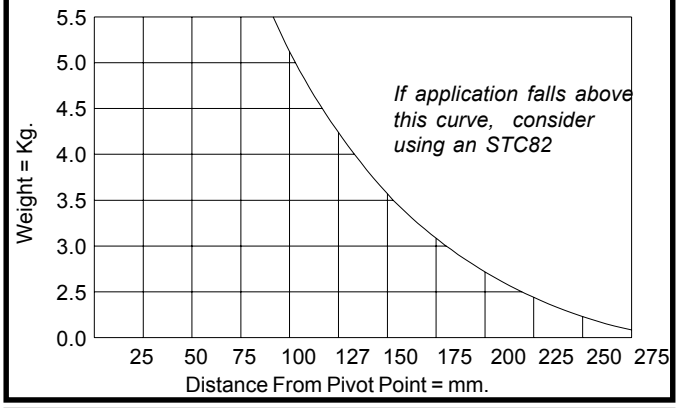
STC52



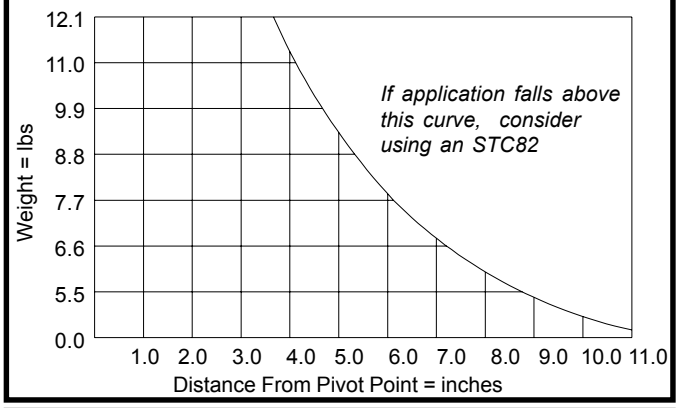
STC52



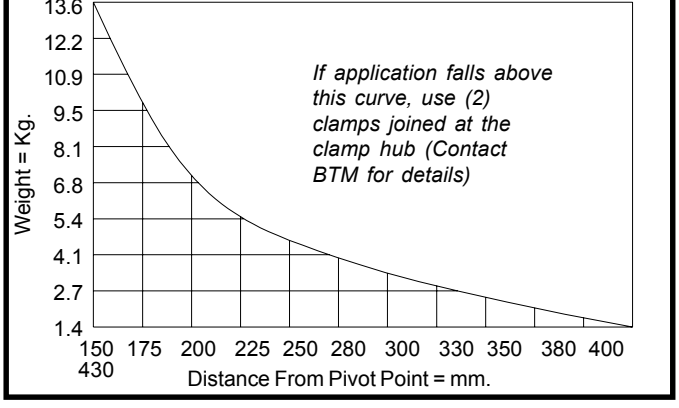
STC62



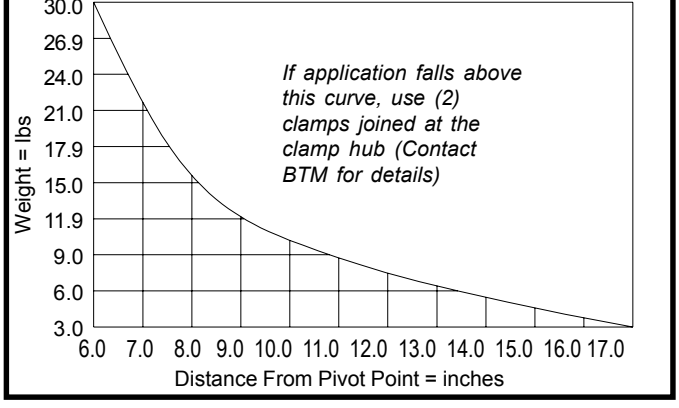
STC62

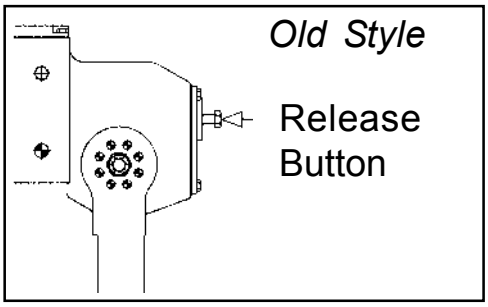


STC82



STC82

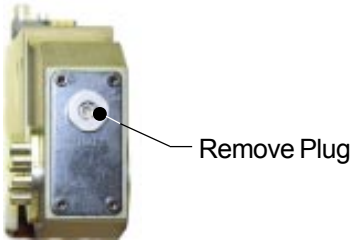


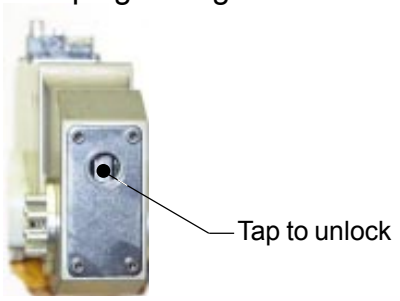


12. Manual Unlock - Release button:
Older model STC clamps are equipped with a release button which allows the clamp to be manually opened when the air is off during setup. A mallet may be required to tap the release button, and then the arm to open the clamp.

12.1 Manual Unlock Access
STC Clamps are now being manufactured with an unlock access, rather than the release button. To unlock the STC clamp with the air off, remove the front cover plug and and tap the linkage with a delrin punch to unlock the mechanism. Replace the plug and tighten.

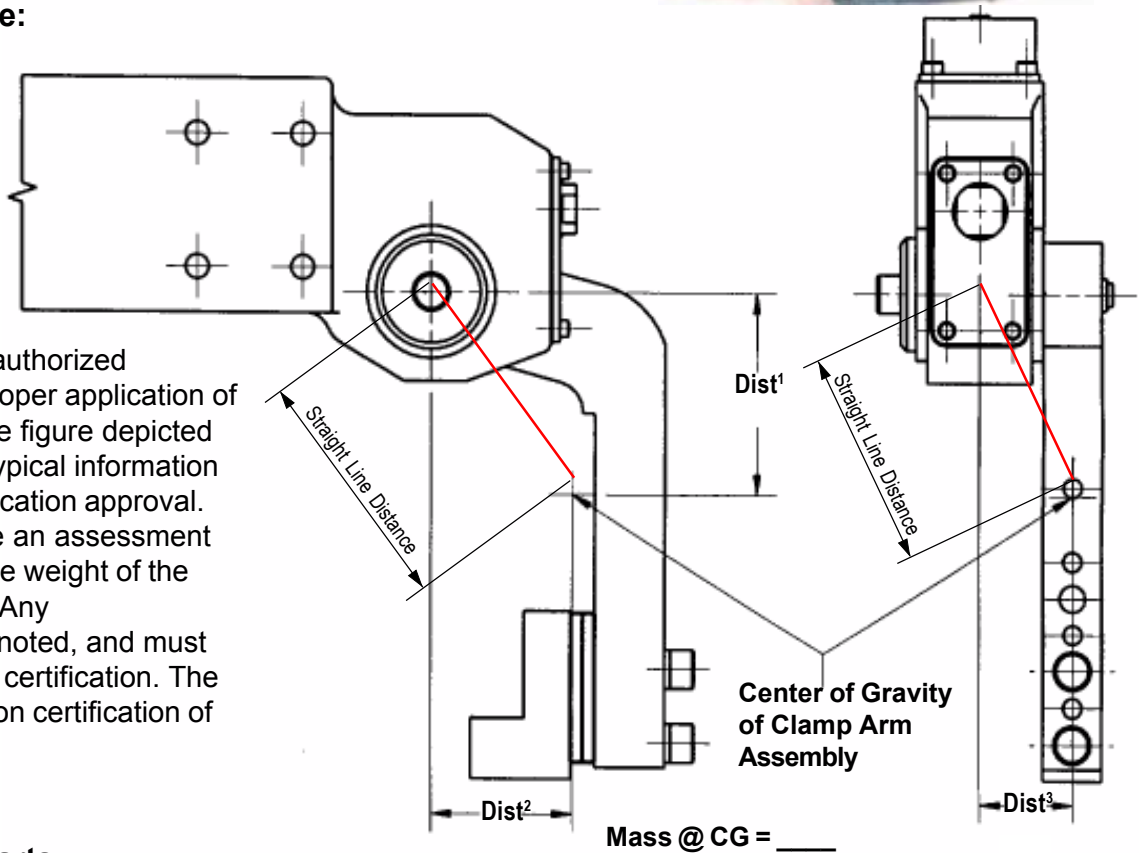
New Style





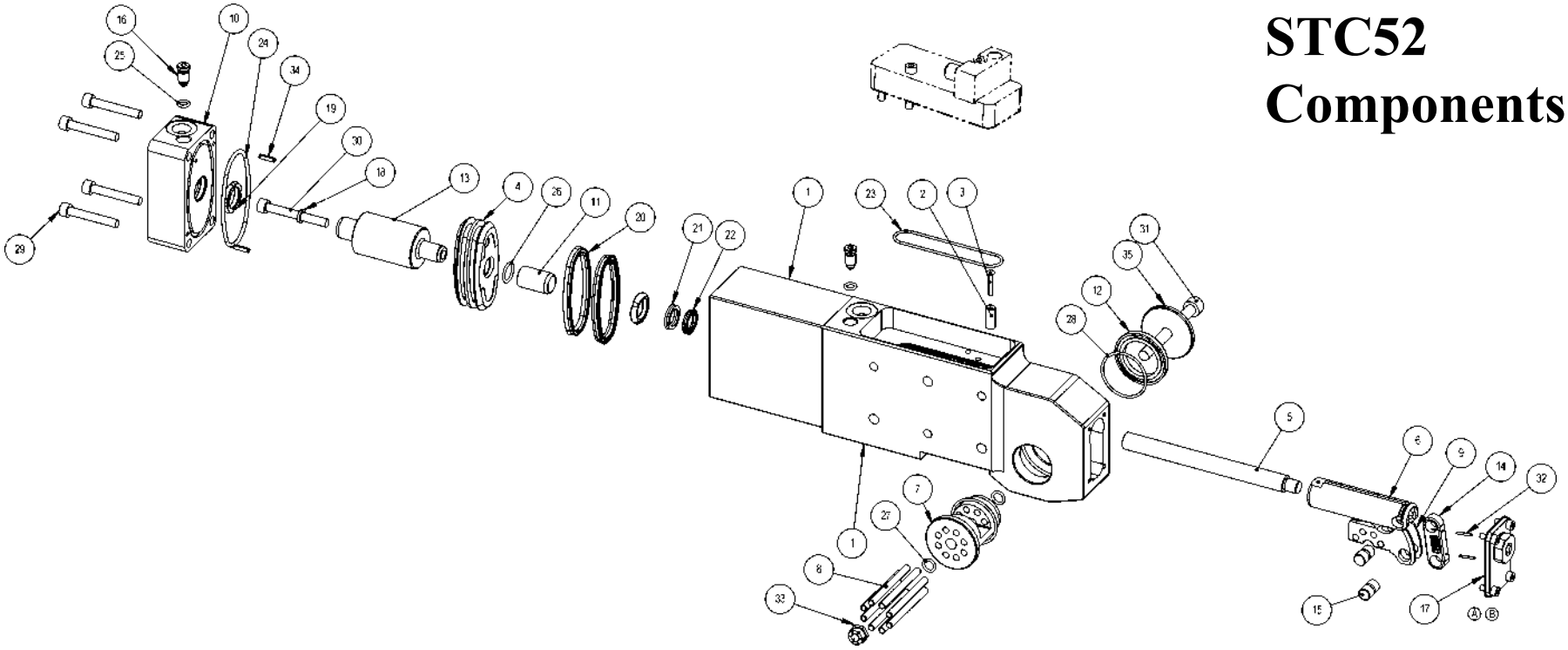
13. Buy Off Procedure:

Please contact BTM's authorized Distributors to certify proper application of its STC-VP clamps. The figure depicted to the right shows the typical information that is required for application approval. Certification will include an assessment of the cycle rate and the weight of the clamp arm assembly. Any misapplications will be noted, and must be corrected to recieve certification. The warranty is dependant on certification of the application.



14. Ordering Spare Parts:
BTM STC Model Clamps are warranted for life of the tool which the clamp was originally sold for. Therefore, the unit is generally exchanged or repaired at the factory. If spare parts are required, contact BTM sales at 810-364-4567.

STC52 Components



Clamp Specs		BTM Assembly Numbers		
	Clamp Opening	1/2-20 SAE Port	G1/4 Port	3/8-18 NPTF Port
Single Arm	30°	733200A	733500A	745000A
	45°	733200B	733500B	745000B
	60°	733200C	733500C	745000C
	75°	733200D	733500D	745000D
	90°	733200E	733500E	745000E
	105°	733200F	733500F	745000F
	120°	733200G	733500G	745000G
Dual Arm	30°	733200J	733500J	745000J
	45°	733200K	733500K	745000K
	60°	733200L	733500L	745000L
	75°	733200M	733500M	745000M
	90°	733200N	733500N	745000N
	105°	733200P	733500P	745000P
	120°	733200R	733500R	745000R

For the series 740700 or 743800, reference the 745000 series.

DET.	QTY.	DESCRIPTION	BTM NO.	DET.	QTY.	DESCRIPTION	BTM NO.
1	1	BODY - 3/8 NPTF	740701A	18	1	WASHER - .395 X .280 X .062	019130
2	1	PROX ACTUATOR	733205A	19	2	PARKER V6 CUSHION SEAL	018092
3	1	PROX MOUNTING SCREW	733206A	20	2	POLYPAK SEAL	019127
4	1	PISTON	727001A	21	1	PARKER U-CUP PACKING	018085
5	1	PISTON ROD	727002A	22	1	1/8 C/S SQB POLYSEAL	019186
6	1	SLIDE BLOCK	727003A	23	1	O-RING	018083
7	1	ARM MOUNT HUB	727004A	24	1	O-RING	018666
8	8	ARM MOUNT PIN - SINGLE	727005A	25	2	O-RING	017531
9	1	DRIVE ARM	727006A	26	1	O-RING	004769
10	1	END CAP - 3/8 NPTF	740702A	27	2	O-RING	005418
11	1	FRONT CUSHION	call BTM	28	2	URETHANE O-RING	018694
12	1	HUB RING	727012A	29	4	M6 x 40 LG. S.H.C.S.	015764
13	1	REAR CUSHION	See p. 5	30	1	M6 x 50 LG. S.H.C.S.	014741
14	1	LINK	719207A	31	1	M8 x 75 LG. S.H.C.S.	018368
15	2	LINK PIN	719209A	32	2	1/16 DIA. x 1/2 LG. ROLL PIN	001648
16	2	CUSHION ADJUSTMENT SCREW	707422A	33	1	M8 FLEX-LOC NUT THIN HT.	018367
17	1	UNLOCK PLUG COVER PLATE	774100A	34	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350

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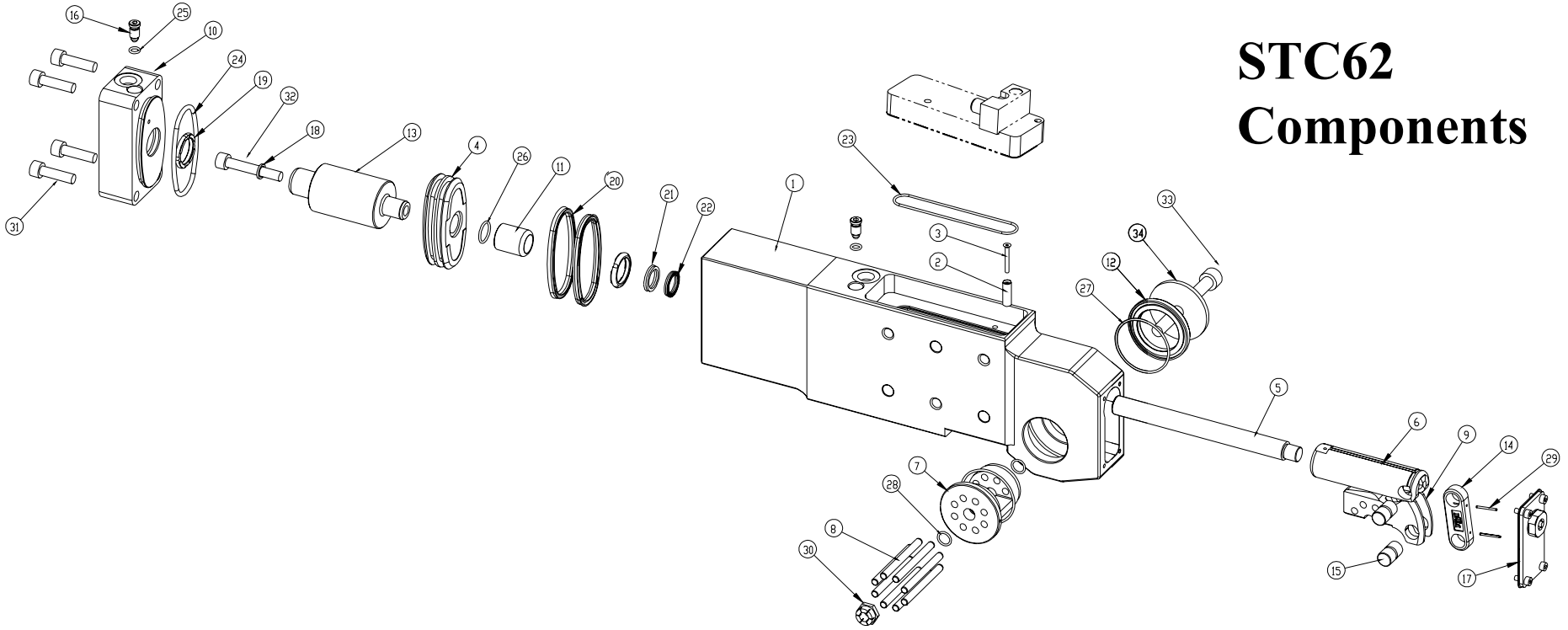
STC62 Components



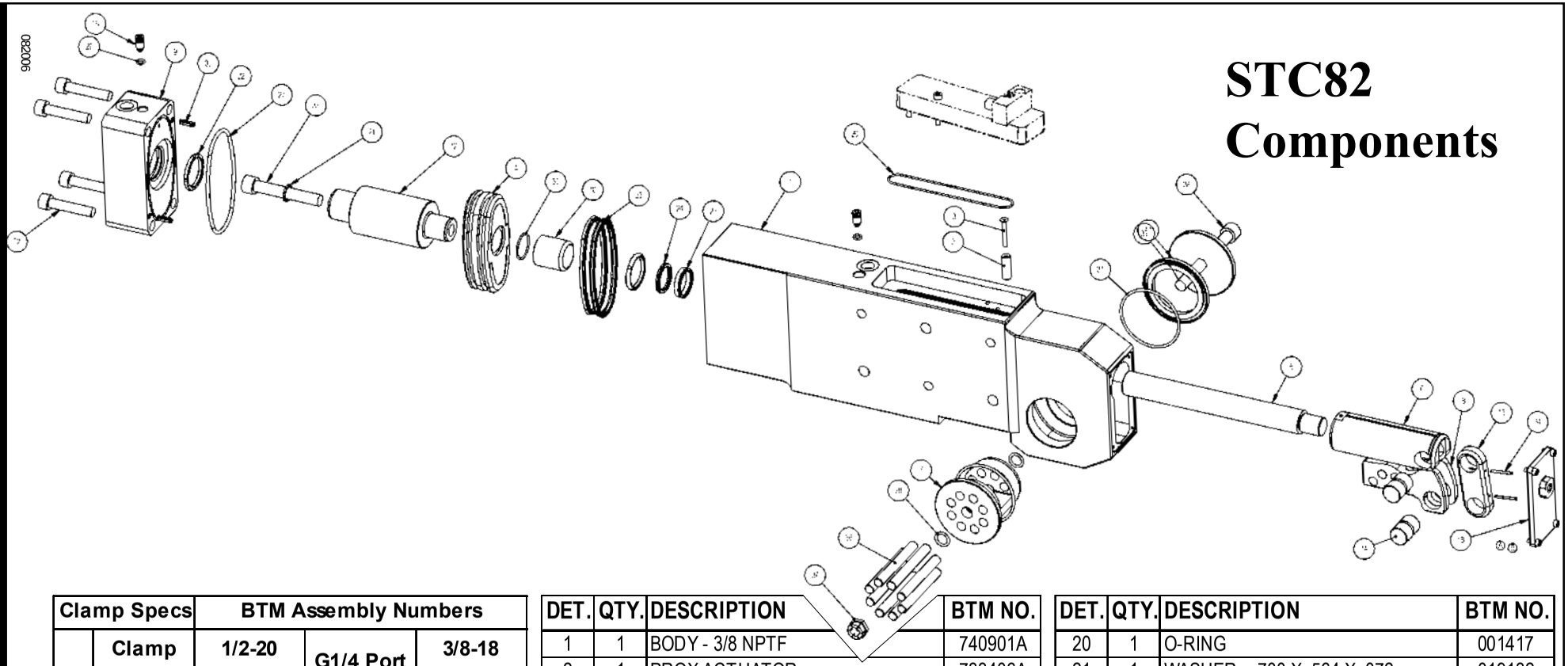
Clamp Specs		BTM Assembly Numbers		
	Clamp Opening	1/2-20 SAE Port	G1/4 Port	3/8-18 NPTF Port
Single Arm	30°	733300A	733600A	745100A
	45°	733300B	733600B	745100B
	60°	733300C	733600C	745100C
	75°	733300D	733600D	745100D
	90°	733300E	733600E	745100E
	100°	733300F	733600F	745100F
	120°	733300G	733600G	745100G
Dual Arm	30°	733300J	733600J	745100J
	45°	733300K	733600K	745100K
	60°	733300L	733600L	745100L
	75°	733300M	733600M	745100M
	90°	733300N	733600N	745100N
	100°	733300P	733600P	745100P
	120°	733300R	733600R	745100R

For the series 740800 or 743900, reference the 745100 series.

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	BODY 3/8-18 NPTF	740801A
2	1	PROX ACTUATOR	733305A
3	1	PROX MOUNTING SCREW	733306A
4	1	PISTON	726001A
5	1	PISTON ROD	726002A
6	1	SLIDE BLOCK	726003A
7	1	ARM MOUNT HUB	726004A
8	1	DRIVE ARM	726006A
9	1	END CAP 3/8-18 NPTF	740802A
10	1	FRONT CUSHION	call BTM
11	1	HUB RING	726011A
12	1	REAR CUSHION	See p. 5
13	1	LINK	707429A
14	2	LINK PIN	707407A
15	2	CUSHION ADJUSTMENT SCREW	707422A

DET.	QTY.	DESCRIPTION	BTM NO.
16	1	UNLOCK PLUG COVER PLATE	772600A
17	1	WASHER - .500 X .377 X .06	019131
18	2	PARKER V6 CUSHION SEAL	017538
19	2	POLYPAK SEAL	019128
20	1	PARKER U-CUP PACKING	017536
21	1	1/8 C/S SQB POLYSEAL	019187
22	1	O-RING	018083
23	1	O-RING	018653
24	2	O-RING	017531
25	1	O-RING	001417
26	2	URETHANE O-RING	018695
27	2	METRIC O-RING	020404
28	2	1/16 DIA. x 3/4 LG. ROLL PIN	017537
29	4	M8 x 30 LG. S.H.C.S.	016099
30	1	M8 x 50 LG. S.H.C.S.	018512

STC82 Components



Clamp Specs		BTM Assembly Numbers		
	Clamp Opening	1/2-20 SAE Port	G1/4 Port	3/8-18 NPTF Port
Single Arm	30°	733400A	733700A	745200A
	45°	733400B	733700B	745200B
	60°	733400C	733700C	745200C
	75°	733400D	733700D	745200D
	90°	733400E	733700E	745200E
	105°	733400F	733700F	745200F
	120°	733400G	733700G	745200G
Dual Arm	30°	733400J	733700J	745200J
	45°	733400K	733700K	745200K
	60°	733400L	733700L	745200L
	75°	733400M	733700M	745200M
	90°	733400N	733700N	745200N
	105°	733400P	733700P	745200P
	120°	733400R	733700R	745200R

For the series 740900 or 744000, reference the 745200 series.

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	BODY - 3/8 NPTF	740901A
2	1	PROX ACTUATOR	733406A
3	1	PROX MOUNTING SCREW	733407A
4	1	PISTON	726501A
5	1	PISTON ROD	726502A
6	1	SLIDE BLOCK	726503A
7	1	ARM MOUNT HUB	726505A
8	1	DRIVE ARM	726509A
9	1	END CAP - 3/8 NPTF	740902A
10	1	FRONT CUSHION	call BTM
11	1	HUB RING	726516A
12	1	REAR CUSHION	See p. 5
13	1	LINK	726504A
14	2	LINK PIN	726511A
15	2	CUSHION ADJUSTMENT SCREW	707422A
16	1	UNLOCK PLUG	772601A
17	1	FRONT COVER	741801A
18	1	FRONT COVER GASKET	741802A
19	4	M4 x 10 LG. S.H.C.S.	018371

DET.	QTY.	DESCRIPTION	BTM NO.
20	1	O-RING	001417
21	1	WASHER - .700 X .564 X .072	019132
22	2	PARKER V6 CUSHION SEAL	018461
23	2	POLYPAK SEAL	019129
24	1	PARKER U-CUP PACKING	018462
25	1	POLYPAK SEAL	019430
26	1	O-RING	018083
27	1	O-RING	018459
28	2	METRIC O-RING	019181
29	2	O-RING	017531
30	1	O-RING	003411
31	2	URETHANE O-RING	018696
32	4	M10 x 50 LG. S.H.C.S.	017050
33	1	M12 x 75 LG. S.H.C.S.	016250
34	2	3/32 DIA. x 1" LG. ROLL PIN	018466
35	2	3/16 DIA. x 5/8 LG. ROLL PIN	001645
36	8	STC82: ARM MOUNT PIN - SINGLE	726506A
37	1	M12 FLEX-LOC NUT THIN HT.	018464
38	1	M12 x 110 LG. S.H.C.S.	018465

16. General Specifications

- PATENTED TRILOK MECHANISM
- STANDARD N.A.A.M.S. MOUNTING
- SEALED MECHANISM - LUBRICATED FOR LIFE OF CLAMP
- BODY CONSTRUCTED FROM AIRCRAFT ALUMINUM - HARD COATED TO RC 70 FOR EXCELLENT WEAR CHARACTERISTICS
- PIN ARM DRIVE FOR VERSATILE ARM POSITIONING & SIMPLIFIED ARM CHANGE
- ACCESS TO MANUALLY UNLOCK CLAMP LINKAGE

- EQUIVALENT BORE SIZES: 52.0mm [2.00"], 62.0mm [2.50"], & 82.0mm [3.25"] DIA.
- EASILY ADJUSTABLE ARM OPENING 30°, 45°, 60°, 75°, 90°, 105°, 120°
- MAXIMUM CYLINDER STROKE FOR 120° ARM OPENING = STC52 ~ 70.28mm [2.77"]
  STC62 ~ 93.1mm [3.66"]
  STC82 ~ 118.8mm [4.68"]
- APPROX. WEIGHT*(WITHOUT ARMS)* : STC52 ~ 3.8 kg [8.4 lbs], STC62 ~ 5.7 kg [12.6 lbs.], STC82 ~ 13.6 kg [30.0 lbs]
- OPERATING PRESSURE: 2.75 TO 7 BARS [40 TO 100 PSI] (LUBRICATED OR NON-LUBRICATED COMPRESSED AIR)
  ~ USE FLOW CONTROLS TO REDUCE IMPACT
- HOLDING TORQUE: *WITHOUT AIR*
  STC52 ~ 290 N-m [214 ft-lbs]
  STC62 ~ 450 N-m [330 ft-lbs]
  STC82 ~745 N-m [550 ft-lbs]
- CLAMPING TORQUE: AT HUB
  STC52 ~ 89.5 N-m [66 ft-lbs @ 5.5 BARS [80 PSI]
  STC62 ~ 257.6 N-m [190 ft-lbs @ 5.5 BARS [80 PSI]
  STC82 ~ 496.2 N-m [366 ft-lbs @ 5.5 BARS [80 PSI]
- CLAMP INTERCHANGABILITY TOLERANCE: ±0°15' (CLAMP TO CLAMP)
- ARM REPEATABILITY IN CLOSED POSITION: ±0° 3'

FIGURE 1
CLAMP INTERCHANGEABILITY TOLERANCE

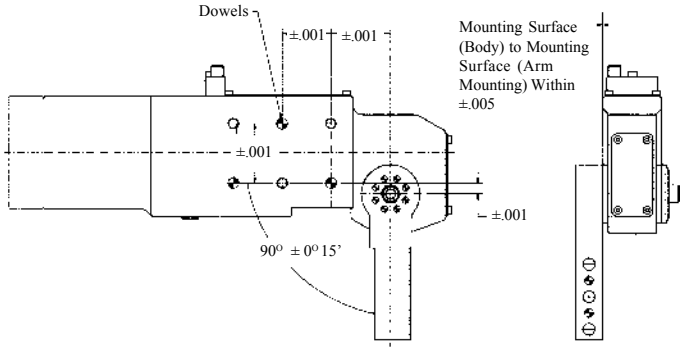
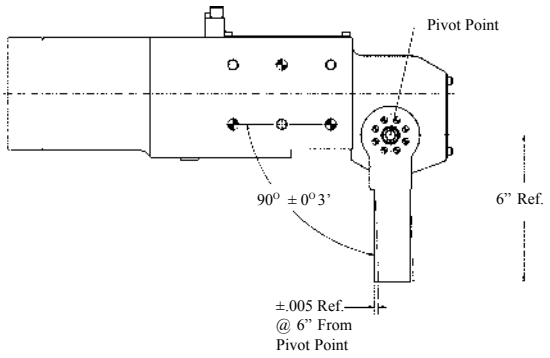


FIGURE 2
ARM POSITION CYCLIC REPEATABILITY



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Warranty:

BTM Corporation warranties its STC Clamps against defects in material and workmanship for for the life of the tool which the clamp was originally sold for.

This warranty is limited to replacing or repairing at BTM's option, F.O.B. BTM's factory, any part found by BTM to be defective in materials and/or workmanship. Any application of a BTM product outside the intended use of the product shall not be warranted by BTM Corporation. Furthermore, BTM will not be liable for any expenses incurred for repairs or replacement made outside BTM's facilities without written consent (or damages arising out of such replacements or repairs). Under no circumstances will BTM be held responsible for any consequential damages.
The warranty is limited to the repair or replacement of the defective part(s) and does not include installation.

This warranty is the only warranty extended by the seller in connection with any sale made hereunder and is in lieu of all other warranties, express, implied or statutory including warranties of merchantability and fitness for purpose.

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